

METHOD AND APPARATUS FOR PROTECTIVE ENCAPSULATION
OF STRUCTURAL MEMBERS SUBJECTED TO TIDAL INFLUENCE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to a field of encasement or encapsulation of structural members, and more particularly to the encasement or encapsulation of structural members subject to submergence in either fresh water or salt water.

Related Applications

Applicant claims the benefit of provisional application Serial No. 60/447,670, filed February 19, 2003.

2. Description of the Prior Art

The use of piles or piers as structural supports for wharfs, bridges, and other marine environment structures is well known. The usual materials of construction for such marine structures are concrete, steel, wood or a combination or composite of the two or more of these materials. All of the aforementioned materials of construction are vulnerable to deterioration. In particular, wooden pilings have been used for many years to support piers, wharfs, boat slips, and in some instances, older bridges. It is well known that such pilings are subject to may hazards necessitating the replacement of same. One major source of damage which drastically shortens the life expectancy of wood piling is the attack on the piling by certain marine parasites and

microorganisms. These marine microorganisms feed upon the cellulose material of the wood piling, extracting a food substance of a polysaccharide carbohydrate nature.

Particular marine microorganisms known to attack wooden pilings include limnoria, gribbles, and teredo microorganisms. The teredo begins life as a larva and begins its metamorphosis into an adult when it has attached itself to the surface of a piece of submerged timber. The teredo will begin burrowing into the submerged timber and its tail appendage will seal off the entry way. The only visible presence of a teredo is the occurrence of two microscopic siphon tubes, one for the inhalation of fresh water, and the other for exhalation. In its boring, the teredo will dispose of waste through the exhalation siphon and the inhalation siphon is designed to produce continuously circulating water over the teredo's gills for the absorption of oxygen. New larva is also disposed of through the exhalation siphon to infest the same submerged timber, or other timber. The specific danger with the teredo is that the submerged timber pile appears to be secure and in tack, when in fact, the interior of the pile may contain a great deal of infestation, thus weakening the pile.

The second marine bore, of the limnoria species, which is sometimes referred to as a gibble, resembles lice and is about the size of a small ant, and it is capable of boring holes of approximately three millimeters in diameter. The limnoria rarely penetrates the timber for more than ten to twelve millimeters, but

they normally infest in great numbers on the outer layer of the submerged timber, such that the submerged timber takes on a honeycombed appearance with tiny individual channels. This attack, combined with the eroding affects of the sea's tide, will break down the surface of the wood and expose new surfaces for attack.

Previous efforts to safeguard these hazards include the impregnation of the structures and/or the coating of the surfaces with special preservatives and protective coatings, using materials such as creosote, tar, and impervious paints. While these materials do cover certain hazards, they are ineffective with respect to others, and the chemical treatments are subject to leeching, scaling and erosion by action of the constantly moving surrounding water, taken together with the temperature changes and shock forces. Further the high solidity and other constituents of sea water also contribute to degradation of these protective measures.

Applicant is the holder of U.S. Patents 5,829,920 and 5,919,004 directed towards an apparatus and method to form a combination of wrap and marine acceptable filler composite which can be pumped within the wrap in aerosol form which solidifies to fill the gap between the wrap and the piling, and also to fill any gaps in the piling caused by the aforementioned marine borers. The subject matter of Applicant's two patents directed to those portions of the pilings that are constantly under water, and those portions of the pilings that are temporarily under water during

normal high tide.

There is however a need to protect the upper portion of a piling where it contacts the header of a pier or wharf, which area while normally not under water, may be subject to being under water during very high tides or flooding. Applicant's invention is directed to a method of impregnating this portion of the piling and header to prevent infestation by marine borers.

OBJECTS OF THE INVENTION

An object of the present invention is to provide for a novel method and apparatus for encasement or encapsulation of a portion of a piling and header of a wharf which may be subjected to infrequent submergence.

Another object of the present invention is to provide for a novel method and apparatus for the encasement or encapsulation of a portion of a piling and header of a wharf which can be installed in situ.

A still further object of the present invention is to provide for a novel method and apparatus for the encasement and encapsulation of a portion of a piling and the header of a wharf which is efficacious in protecting as well as preventing further infestation and weakening of the timber.

SUMMARY OF THE INVENTION

A method and composition of matter for the encapsulation of the upper portion of a piling and header associated with a wharf, pier or the like, whereby this upper portion of the piling and

header, while normally above the high tide mark, is often subjected to submergence due to climatic conditions and requires encapsulation by the composition of matter disclosed herein to prevent attack from marine microorganisms or marine borers.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects of the present invention will become apparent, particularly when taken in light of the following illustrations wherein:

Figure 1 is a side view of an unprotected piling subjected to marine microorganisms; and

Figure 2 is a side view of Applicant's protective apparatus as previously patented.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 illustrates a side view of a typical piling in position which has suffered the infestation of marine microorganisms and marine borers. The typical pile 10 has been driven into the silt or sandy bottom 11 of an ocean or salt water estuary or fresh water estuary to a sufficient depth to provide stability in a pier, bulkhead or other structure 14 that has been constructed on top of the piling 10. The piling 10 comprises a normally generally cylindrical member which is subject to attack from the ambient atmosphere above the high water point 16 and the action of the tide of the salt water ocean or estuary below high tide point 16. It is in this area below the high tide mark 16 which suffers the most from the infestation attack of

microorganisms or marine borers. In Figure 1 there is illustrated a typical attack from the microorganism or marine borer limnoria, which attacks the submerged portion of the timber or wood pile 10 in great numbers and causes the honey comb or hour glass effect, which is not normally visible to the observer above the surface of the water. This attack can reduce the supporting strength of the wood or timber pile by as much as 15 percent per year if gone untreated. In this particular infestation attack, it can be seen that the piling has undergone severe deterioration 20 proximate to its lower end to the extend that such pier or structure which the pile is supporting is in danger.

While the result of the infestation illustrated in Figure 1 is shown proximate to the silt or sandy base 11, the infestation and resultant weakening of the piling could occur any where along the longitudinal axis of the piling that is repetitively positioned below the high tide mark 16. The Applicant has addressed this issue with respect to patents 5,829,920 and 5,919,004 which teach a method and apparatus for wrapping the piling and encapsulating it with a marine grade foam (see Figure 2). However, there remains a minor problem which has still not been addressed properly. This is the area of the piling 10 proximate the header 22 which supports the pier, wharf or the like. This area is not normally subjected to submergence since the high tide mark is generally below this level. However, in certain circumstances, high flooding, ice jams and the like this area of the upper piling 10 and header 22 can be

subject to submergence and thus the attack of microorganisms or marine borers. One way to address the problem would be to install the wrap as disclosed in the aforesaid patents to as high a point as possible on the piling. However, this solution does not protect the wooden or timber header which supports the pier or wharf. The more effective solution is to treat the upper portion of the piling 10 and wooden header 22 with a composition of matter.

The composition of matter comprises a 100% solids, spray applied, aromatic polyurea coating which exhibits extraordinary toughness and elastomeric performance characteristics. It is applied in thicknesses of from 30-250mils or greater using multiple passes. It is seamless, abrasive resistant, and water proof and can be applied in situ.

In the preferred embodiment, the composition of matter used to treat the upper portion of the piling and header is a foam comprising a mixture of isocyanate, up to 20 percent by weight, CHClF₂, up to 2 percent by weight of water, and a combination of polyols having an average OH number of from about 300 to 500 and comprising polyalkoxylated glycerine having an OH number of from about 200 to about 300 in which the alkoxy groups each have from two to about three carbon atoms.

While the present invention has been described with respect to the exemplary embodiments thereof, it will be recognized by those of ordinary skill in the art that many modifications or changes can be achieved without departing from the spirit and scope of the

invention. Therefore it is manifestly intended that the invention be limited only by the scope of the claims and the equivalence thereof.